

CLAIMS

1. A hydraulic stepless transmission comprising a first hydraulic system that has a first plunger and a swash plate, which the first plunger abuts on, and a second hydraulic system that has a second plunger and a swash plate, which the second plunger abuts on, wherein formed in a cylinder block are first and second plunger holes that contain the first and second plungers, respectively, a hydraulic closed circuit that connects the first and second plunger holes, and a distributing valve hole that contains a distributing valve for switching flow direction of hydraulic fluid in the hydraulic closed circuit, a shaft is provided that extends through the cylinder block, the shaft and the cylinder block synchronously rotate, the first and second plunger holes are formed in parallel to the shaft, respectively, and the swash plate of the second hydraulic system is rotatably supported around the shaft, the hydraulic stepless transmission being **characterized in that** the first and second plungers are urged toward the swash plates by springs provided in the corresponding first and second plunger holes, respectively, the swash plate of the first hydraulic system is supported by an outer ring of a first combined thrust and radial bearing that supports the shaft, the swash plate of the second hydraulic system is supported by an outer ring of a second combined thrust and radial bearing that supports the shaft, and movement of inner rings of the first and second combined thrust and radial bearings in an axial direction of the shaft is regulated.
2. The hydraulic stepless transmission according to claim 1, **characterized in that** a first regulating member, which has a surface that is parallel to a side face of the inner ring of the first combined thrust and radial bearing, and is spaced apart by a minute distance from the side face of the

inner ring, and a second regulating member, which has a surface that is parallel to a side face of the inner ring of the second combined thrust and radial bearing, and is spaced apart by minute distance from the side face of the inner ring.

3. The hydraulic stepless transmission according to claim 1, **characterized in that** the distributing valve hole is located in parallel to the shaft and is closer to the shaft than the plunger hole; and

wherein an oil passage that connects the plunger hole and the distributing valve hole is formed in a radial direction.

4. The hydraulic stepless transmission according to claim 1, **characterized in that** the distributing valve hole is formed in parallel to the shaft so as to extend through the cylinder block.

5. The hydraulic stepless transmission according to claim 1, **characterized in that** a high pressure oil chamber and a low pressure oil chamber are juxtaposed along an axial direction in the cylinder block so as to be closer to the shaft than the first and second plunger holes;

wherein a spline section is formed in the shaft, and the shaft is fit into the cylinder block at the spline section; and

wherein the low-pressure oil chamber communicates with the spline section of the shaft.

6. The hydraulic stepless transmission according to claim 1, **characterized in that** an outer circumferential surface of the swash plate of the second hydraulic system is formed through machining by using a first machining central axis, which is a line perpendicular to a swash plate surface of this swash plate, a machining central axis, which is a center

line of the shaft, and a second machining central axis, which is a line that is parallel to a center line of the shaft and is offset to a side where a gap narrows between the swash plate surface and a surface opposite to the swash plate surface.

7. A power transmission comprising:

the hydraulic stepless transmission according to any one of claims 1 to 6;

a device which transmits or shuts down power to the shaft; and

a device which inputs turning force from the swash plate of the second hydraulic system and outputs rotation in a direction identical or reverse to that of the swash plate of the second hydraulic system.